



**Health Quality &  
Safety Commission**  
Te Tāhū Hauora

# **Raise the Flag: Sepsis quality improvement: measurement guide**

Hikitia te Haki: Kounga whakapai: he  
aratohu ine

September 2025



Published September 2025 by Health Quality & Safety Commission Te Tāhū Hauora,  
PO Box 25496, Wellington, 6146.

ISBN 978-1-991122-37-7

Available online at [www.hqsc.govt.nz](http://www.hqsc.govt.nz)

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**Te Kāwanatanga  
o Aotearoa**  
New Zealand Government

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# Acknowledgements

Health Quality & Safety Commission Te Tāhū Hauora (the Commission) acknowledges the significant work of everyone who has been involved in the development of the sepsis package. In particular, the sepsis project team would like to thank the following:

- Sepsis Trust New Zealand
- National Sepsis Technical Advisory Group (STAG)
- Bennett and Pepa Pomana, for sharing their lived experience
- Health New Zealand Te Whatu Ora clinical staff who performed an audit that informed the sepsis measurement guide.

Members of the Commission's STAG have been major contributors to the development of the national sepsis pathway and this guide. This group was established in September 2024 and includes representatives from the following professional groups:

- Ambulance Services (Hato Hone St John and Wellington Free Ambulance)
- Australasian Society for Infectious Diseases
- Australian and New Zealand College of Anaesthetists
- Australian and New Zealand Intensive Care Society
- Australian College for Emergency Medicine
- Health New Zealand Te Whatu Ora
- New Zealand Antimicrobial Stewardship & Infection Pharmacist Expert Group
- New Zealand College of Critical Care Nurses
- New Zealand College of Medicine
- New Zealand College of Midwives
- New Zealand Microbiology Network
- New Zealand Nurses Organisation
- Paediatric Society of New Zealand
- Royal Australasian College of Surgeons
- Royal Australian and New Zealand College of Obstetricians and Gynaecologists
- Royal New Zealand College of General Practitioners
- Royal New Zealand College of Urgent Care
- Sepsis Trust New Zealand.

## **Commitment to Te Tiriti o Waitangi and health equity | Ū ki Te Tiriti me te hauora tautika**

The sepsis project team is committed to developing and implementing the sepsis project in a manner that enables equitable outcomes for Māori. The team incorporated Te Tiriti o Waitangi principles throughout the project.

The team applied an equity lens to various areas of the project by:

- having a Māori advisor in the project team, who consulted with other Māori elders when necessary
- using an ethnicity or demographic lens for data collection and review
- incorporating the lived experience of sepsis consumers and their whānau
- advising hospital project teams to collaborate with Māori and Pacific representatives, ensuring Te Tiriti principles are embedded and encouraging their involvement in relevant aspects of implementation.

## Purpose

This document provides measurement guidance to support hospitals and clinical teams in implementing the Raise the Flag sepsis package, conducting audit, measuring improvement in processes, sustaining improvements, and identifying opportunities for ongoing quality improvement. This guide aims to standardise sepsis definitions and data collection processes, enabling consistent nationwide reporting of sepsis-related measures.

## Introduction

In light of the fact that sepsis is a leading cause of hospital deaths in the developed world,<sup>1</sup> the Commission recently conducted a scoping exercise on the identification and treatment of sepsis in New Zealand health care settings. It then reviewed the evidence and launched the Raise the Flag sepsis quality improvement project. This initiative included the development of the Raise the Flag sepsis package to improve early recognition and timely treatment of sepsis in hospitals.

Measurement is a vital component of the sepsis package; the Commission has aimed to provide the measures, methods and resources needed for effective implementation and measurement of sepsis care. This guide offers a structured framework to help hospitals identify the gaps and improve that care. It defines a set of standardised process, outcome and balancing measures to support consistent measurement across services, while allowing flexibility for local adaptation. Each measure includes clear definitions, numerators, denominators and data sources, to ensure reliable collection and reporting

Detailed guidance on implementing this measurement framework is available in the sepsis implementation guide [hqsc.govt.nz/sepsis](https://hqsc.govt.nz/sepsis)

## Measuring sepsis

Globally, measuring sepsis remains a significant challenge due to the absence of a universally applied definition and the variability of health information systems across countries. In New Zealand, there are currently no nationally agreed measures for sepsis, including compliance with best practice interventions or recommendations on how to measure sepsis. This has led to a non-standardised approach across hospitals, reduced alignment with international standards, limited visibility of sepsis prevalence, and under-recognition of the condition.

Many international efforts to measure sepsis rely on coded health data, particularly through the International Classification of Diseases (ICD) system. The Global Burden of Disease Study<sup>2</sup>, one of the most comprehensive, used coded data to estimate sepsis incidence and mortality worldwide. Countries such as Australia, the United States, and the United Kingdom also use administrative coding data to measure sepsis and develop quality indicators.

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<sup>1</sup> Fleischmann C, Scherag A, Adhikari NKJ, et al. 2016. Assessment of global incidence and mortality of hospital-treated sepsis: current estimates and limitations. *American Journal of Respiratory and Critical Care Medicine* 193(3): 259–72.

<sup>2</sup> Rudd KE, Johnson SC, Agesa KM, et al. 2020. Global, regional, and national sepsis incidence and mortality, 1990-2017: analysis for the Global Burden of Disease Study. *Lancet* 395(10219):200-211.

However, coding practices vary across hospitals, and reliance on diagnosis codes alone may under- or over-estimate true sepsis cases. Differences in documentation, clinician recognition, and coder interpretation further contribute to inconsistencies. As a result, sepsis measurement often requires balancing accuracy, feasibility, and timeliness by combining coded data with audit findings and clinical record reviews to build a more reliable picture of the burden and outcomes of sepsis.

Despite these challenges, coding-based approaches remain the most practical and scalable method for tracking sepsis across large populations, supporting international comparison and informing health policy decisions. This measurement guide aligns with these global approaches by providing a standardised way to measure sepsis in New Zealand. Its focus is to support early recognition and timely treatment, while also serving as a foundation for ongoing refinement and development of sepsis measures within the sector.

## A definition of sepsis

A clear and standardised definition of sepsis is essential, to support reliable measurement. In 2016, Mervyn Singer et al introduced the third international consensus definition of sepsis (Sepsis-3)<sup>3</sup>, which includes both a narrative and a clinical definition. The narrative describes sepsis as 'life-threatening organ dysfunction caused by a dysregulated host response to infection'.

While Sepsis-3 provides a clinically robust definition, applying it for the purposes of measurement can be challenging and time-consuming, as it relies on access to specific clinical results at the point of care. For monitoring purposes, the National Minimum Data Set (NMDS)<sup>4</sup> offers a more feasible approach by retrospectively identifying patients diagnosed with sepsis through diagnosis codes. This approach also aligns with international practice for tracking and trending sepsis cases.

Building on this approach, our team developed a method based on NMDS data and created an algorithm using diagnosis codes and specific criteria. We evaluated performance of this method through a national audit across five public hospitals, encompassing adult, maternity and paediatric populations. Using Sepsis-3 clinical criteria as the reference standard, the audit applied methodology from the Global Burden of Disease Study, which identifies sepsis through both explicit codes (e.g., A40–A41 for septicaemia) and implicit coding combinations of infection and organ dysfunction. Auditors performed structured retrospective chart reviews using a standardised process.

Audit results showed that the explicit method performed better than the implicit method. Among adults, 64 percent of cases identified using explicit codes met the Sepsis-3 clinical criteria. However, the same codes did not perform as well for maternity and paediatric patient populations.

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<sup>3</sup> Singer M, et al. 2016. The Third International Consensus Definitions for Sepsis and Septic Shock (Sepsis-3). *JAMA* 315(8): 801–10.

<sup>4</sup> The NMDS is a large database administered by the Ministry of Health that collects and stores hospital discharge information for both public and private hospitals. This data includes clinical information like diagnoses and procedures, as well as details about hospital stays, such as length of stay, and demographic information like age, sex and ethnicity.



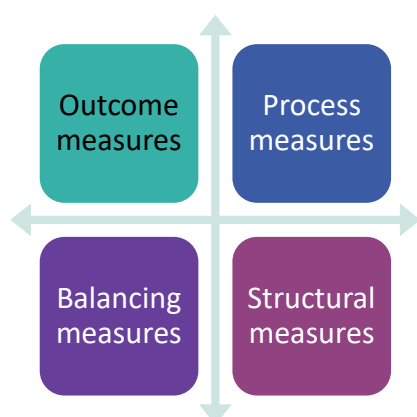
As a result, the methodology now relies solely on the explicit method to identify patients with sepsis in NMDS. To improve the accuracy of codes for maternity and paediatric patient population, the explicit code lists were refined and aligned with internationally recognised lists. This includes lists published in the Global Burden of Disease Study and Sepsis Clinical Care Standard<sup>5</sup> developed by the Australian Commission on Safety and Quality in Health Care.

The audit confirmed that this method works well enough to identify patients diagnosed with sepsis in the adult population with results consistent with the accuracy range reported in other studies. This provides confidence that this method can be used for identifying and measuring sepsis cases. Appendix 1 explains the full sepsis algorithm.

Even though coding-based methodologies are widely used, they are not always reliable on their own. We recommend teams to review and understand the limitations outlined in page 12. We encourage hospital teams to supplement this method with local clinical information and audit data to gain a more complete understanding of sepsis and related outcomes.

## Sepsis measures

Quality improvement projects emphasise the importance of a robust measurement framework that captures and reports data across the health care system. This framework is designed to systematically monitor sepsis care and incidences, identify gaps and evaluate the effectiveness of interventions. It incorporates four key types of measures:



Although these measures are categorised for clarity, some may overlap across categories, depending on the context. The primary aim is to assess the impact of interventions at the local level, while further analysis by patient population (e.g., non-pregnant adults, maternity, paediatrics) and key demographics (e.g., age, ethnicity, sex, socioeconomic deprivation) helps to identify variations in care and areas for improvement. Regular measurement enables benchmarking, supports evidence-based decision-making and informs targeted quality improvement initiatives. Appendix 2 provides a comprehensive list of all measures, including definitions and data sources.

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<sup>5</sup> Australian Commission on Safety and Quality in Health Care. 2022. *Sepsis Clinical Care Standard*. URL: <https://www.safetyandquality.gov.au/publications-and-resources/resource-library/sepsis-clinical-care-standard-2022> (accessed 25 August 2025).



## Outcome measures

In a quality improvement project, outcome measures are used to assess the impact of interventions on both patient health and system performance. In the context of sepsis, these measures provide insights into whether timely recognition and treatment lead to improved survival and overall system improvement.

While these measures are intended to capture the benefits of implementing the sepsis care package, some may take a year or more to demonstrate meaningful change, and others may show trends that appear to negate the benefit. For example, enhanced screening and earlier recognition may initially lead to an increase in intensive care unit admissions, reflecting the appropriate escalation of care rather than poorer outcomes.

Although, we have provided a list of outcome measures for sepsis, any observed changes should be interpreted with caution due to limitations in coding data (see page 12). Improvements in documentation and coding practices may influence these metrics independently of actual changes in clinical care.

We identified five specific outcome measures with detailed definitions and methodology outlined in Appendix 3.

Outcome measures
<ul style="list-style-type: none"><li>• O1: Rate of patients with sepsis diagnosis per 100 episodes of care</li><li>• O2: In-hospital mortality rate for patients with sepsis diagnosis</li><li>• O3: Median length of stay for patients with sepsis diagnosis</li><li>• O4: 30-day readmission rate for patients with sepsis diagnosis</li><li>• O5: Rate of septic shock among patients with sepsis diagnosis</li></ul>

## Process measures

Process measures assess how effectively specific steps, or the overall process is functioning using data collected locally. As the sepsis pathway is implemented, evaluating these processes is essential to help us to determine the effectiveness, efficiency and sustainability of the process. Hospitals or clinical areas can set targets for each measure based on local context.

We have identified two specific process measures; we recommend additional measures under P2 to ensure that the recommended care is consistently delivered and to help teams identify opportunities for improvement. Appendix 4 provides detailed definitions and methodology for each measure.

Process measures
<ul style="list-style-type: none"><li>• P1: Percentage of patients screened for sepsis using the national sepsis pathway or an approved local adaptation</li><li>• P2: Percentage of patients with RED FLAG sepsis who received all applicable Sepsis Six interventions within 60 minutes</li></ul>

## Balancing measure

The balancing measure is used to track and understand unintended consequences arising from the implementation of sepsis interventions. It ensures that improvements in one part of

the system do not result in suboptimal outcomes elsewhere. Appendix 5 provides a detailed definition and methodology for the balancing measure.

Balancing measure
<ul style="list-style-type: none"><li>B1: Rate of intensive care unit admission for patients with sepsis diagnosis</li></ul>



Another balancing measure to consider is antibiotic use. With the emphasis on early recognition and rapid treatment of sepsis, there is a risk of increased prescribing, particularly of broad-spectrum agents. Timely antibiotics are lifesaving, but increased usage of them can carry risks, such as antimicrobial resistance, adverse drug effects and unnecessary exposure in patients who may not have true sepsis. Clinical teams can monitor this trend by developing measures using the data available in hospitals.

### ***Structural measure***

The structural measure is intended to support the implementation phase; it may be discontinued once implementation is complete. This measure helps gauge the scale of adoption and ensure that interventions are applied across all hospital areas. Appendix 6 provides a detailed definition and methodology for the structural measure.

Structural measure
<ul style="list-style-type: none"><li>S1: Percentage of clinical areas using the national sepsis pathway</li></ul>



## **Data collection to support the measures**

Effective data collection is a key component of monitoring and improving sepsis care. Effective data collection involves defining the sampling method, frequency of collection and other relevant details, to ensure accurate and consistent measurement. This section provides a general guide on data collection: Appendices 3, 4, 5 and 6 provide more specific instructions. Consistent with quality improvement principles, project teams should develop a detailed data collection plan that specifies what data will be collected, when, how and by whom, ensuring clarity and accountability.

### ***Data capture***

The data required to support each measure may vary; some data will be available through local patient management systems or the NMDS, and other data will require manual collection. Appendices 3, 4, 5 and 6 provide specific data requirements. In addition, we have developed an audit tool in Microsoft Forms to support outcome and process measures across all patient population. This can be accessed via a link or QR code: see Appendix 7.

### ***Population sampling***

We have developed specific sepsis pathways for adult, paediatric and maternity patients. These pathways are intended for use across various clinical settings, including acute areas such as the emergency department, acute assessment units and inpatient units within hospitals. Teams should sample patients from different groups and clinical areas to check how well the pathways are being used.

## ***Sample size***

If data is available in the NMDS or other electronic systems, the analysis should include all records. For data requiring manual collection, such as process measures, a sampling approach is recommended.

The appropriate sample size for each patient population and clinical setting will depend on a particular hospital's capacity and capability to conduct manual audits. While statistical methods are preferable for determining sample size, they may not always be feasible, due to resource constraints. Hospitals should therefore work with their data and quality improvement teams to agree on a practical and appropriate sample size.

As general guidance, we recommend auditing 20 patients per month per patient population. If fewer than 20 patients are identified, audit all available cases. For example, if only 10 maternity patients are identified in a given month, all 10 should be included. Consult your data and quality improvement teams for further guidance.

## ***Frequency of the audit and data generation***

During testing and implementation of the sepsis package, frequent data collection for process measures is essential, to enable timely adjustments and achieve the desired outcomes. Data collection may occur weekly, fortnightly or monthly. For data available through the NMDS or other electronic systems, extraction can be done quarterly, with analysis and reporting presented by week, month or quarter.

Once high levels of compliance, effectiveness and reliability are achieved, the frequency of data collection may be reduced: for example, from monthly to bi-monthly or quarterly. As teams demonstrate sustained performance, they may choose to discontinue routine collection and reporting of process measures, relying instead on outcome measures to monitor long-term sustainability.

## **Data analysis and reporting**

While the measurement framework centres on defined measures, teams are encouraged to analyse data across patient populations (e.g., adults, maternity, paediatrics) and demographics (e.g., age, ethnicity, sex, socioeconomic deprivation) to gain deeper insights into impact. We recommend that hospitals develop a dashboard that incorporates the proposed measures along with patient population - and demographic-level analyses. This can be created in Microsoft Excel or using more advanced platforms, such as Microsoft Power BI.

Improvement science emphasises the importance of tracking data over time; therefore, we recommend presenting results as time series and measuring unwarranted variation using statistical process control charts. Local sepsis governance or project teams can use these outputs in reports to identify change and variations.

Using clinical information available in the local and national system for sepsis patients, teams can conduct further analyses to gain deeper insights into care delivery. This may include examining types of pathogens, sources of infection, procedures undertaken, comorbidities and other relevant diagnoses.

Data to support most of the outcome and balancing measures in this guidance are available in NMDS or local patient administration system; the hospital data team will need to create a data query in their local system to extract the data required for each measure. Once the query is set up, reports can be generated to an agreed-upon frequency.

## Establishing baseline

Once the data collection plan is finalised, the first step is to collect data to establish a baseline for each measure. This will help the team assess their current performance and set meaningful targets. We recommend using at least one year of stable data to establish a baseline thereby avoiding the impact of seasonal fluctuations. If data is volatile in a single year, averaging over a longer time period, while controlling long-term trends, may be more appropriate. If data is available in the NMDS or other electronic systems, all records should be included in the baseline. For data requiring manual collection, such as process measures, a sufficient sample size should be collected. The appropriate number of patients to audit should be determined in consultation with a hospital's data and quality improvement teams.

## Limitations

The national sepsis audit showed a high rate of false positives<sup>6</sup>, with only 37 percent of cases identified by explicit method meeting the Sepsis-3 definition (clinical reference standard). The rate was notably higher among adults (64 percent) but dropped below 25 percent in maternity and paediatric populations.

The audit also tested cases identified through the implicit method, but only 23 percent met the Sepsis-3 definition, reflecting false negatives<sup>7</sup> as these cases were not captured by the explicit method, due to variation in documentation.

Based on these findings, implicit codes were excluded from the methodology, although this exclusion may underestimate the true number of sepsis cases that meet Sepsis-3 criteria.

Variation in documentation and coding likely contributed to the observed rates of false positives and false negatives, making it difficult to rely solely on coded data to assess outcomes from sepsis interventions. Nevertheless, these measures can still serve as a spur for more detailed local audits.

## Recommendations for using the sepsis definition and methodology

- **Interpretation of data:** The explicit method underpins all sepsis measures in this document. Improvements in clinical recognition and documentation can artificially inflate sepsis rates, making it difficult to distinguish between true increases in incidence and better case finding. These limitations mean that while explicit codes

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<sup>6</sup> Cases classified as sepsis using the explicit method but, upon clinical record review, did not meet the Sepsis-3 definition (clinical reference standard)

<sup>7</sup> Cases that met Sepsis-3 definition (clinical reference standard) but were not classified as sepsis using explicit method.

provide a straightforward approach, they should be interpreted cautiously and ideally supplemented with other indicators to give a more accurate picture of sepsis burden and quality improvement.

In particular, they are well suited to identifying potential areas that need local audit and clinical review. The susceptibility to changed coding behaviours, together with the current discrepancy between explicit coding results and those picked up in clinical audit limit its usefulness as a routine monitoring measure used for judgment.

- **Local audits and clinical review:** Integrating local audit findings and clinical record reviews with coded data provides a more accurate and comprehensive understanding of sepsis care. By combining this coded data with insights from local audits and clinical record reviews, hospitals can validate coding accuracy, identify cases that may have been missed, and better understand variations in care delivery. This integrated approach strengthens the reliability of sepsis measurement, supports continuous quality improvement, and ensures that both the scale of the problem and opportunities for improvement are fully recognised.
- **Report limitations:** It is important to clearly state the limitations of coded data when used alone. Combining it with local audit and clinical reviews offers a more complete and reliable picture, but decision-makers should remain aware of the constraints of each approach.

Despite its limitations, the explicit coding method remains a valuable tool for understanding **variation and change** in sepsis prevalence. The insights it provides help highlight areas for improvement and guide the ongoing refinement of sepsis definitions and measurement approaches. Our adoption of explicit codes aligns with international best practices and is supported by the sepsis technical advisory group. Awareness of these limitations is essential when interpreting explicit-code data for monitoring, benchmarking, and guiding quality improvement initiatives.

## Summary

We have designed this measurement guidance to provide hospitals and clinical teams with a structured framework to track, evaluate and improve sepsis care. By providing nationally standardised measures and allowing flexibility for local adaptation, we hope to ensure both consistency and relevance across different settings. The measures, data collection methods and tools outlined here are intended to support teams to achieve meaningful improvements in patient outcomes, care processes and system reliability.

Successful implementation will require collaboration between clinical teams and data teams, supported by quality improvement principles within defined governance structures. Over time, consistent measurement and analysis and transparent reporting will not only enable progress but also ensure that improvements in sepsis care are sustained.

Ultimately, this guide is a resource to support frontline teams, hospital leaders and system partners in their shared commitment to reducing harm from sepsis and improving the care experience for patients and their whānau.

# Appendix 1: Sepsis definition and methodology

A patient is considered to have sepsis if a pre-defined set of explicit ICD-10-AM<sup>8</sup> diagnosis codes is assigned during an episode of care. The explicit method identifies sepsis directly through codes that specifically reference sepsis. This approach assumes that sepsis has been clearly recognised and documented by clinicians and accurately coded by hospital coders. Consequently, explicit coding offers a straightforward means of capturing sepsis cases from the NMDS (or local patient administration system) and is commonly employed in epidemiological studies, clinical audits and benchmarking.

**Table 1: ICD-10-AM 12th edition, explicit sepsis codes**

Code	description
A021	Sepsis due to Salmonella
A037	Sepsis due to Shigella
A207	Sepsis due to Plague
A217	Sepsis due to Tularaemia
A227	Sepsis due to Anthrax
A237	Sepsis due to Brucella
A247	Sepsis due to Glanders and Melioidosis
A267	Sepsis due to Erysipelothrix [erysipeloid] [rhusiopathiae]
A2801	Sepsis due to Pasteurella, not elsewhere classified
A2821	Sepsis due to Extraintestinal Yersiniosis
A327	Sepsis due to Listeria [monocytogenes]
A397	Sepsis due to Meningococcus
A400	Sepsis due to Streptococcus, group A
A401	Sepsis due to Streptococcus, group B
A4021	Sepsis due to Streptococcus, group D
A4022	Sepsis due to Enterococcus
A403	Sepsis due to Streptococcus pneumoniae
A408	Other Streptococcal sepsis
A409	Streptococcal sepsis, unspecified
A410	Sepsis due to Staphylococcus aureus
A411	Sepsis due to other specified Staphylococcus
A412	Sepsis due to unspecified Staphylococcus
A413	Sepsis due to Haemophilus influenzae
A414	Sepsis due to anaerobes
A4150	Sepsis due to unspecified Gram-negative organisms

<sup>8</sup> Independent Health and Aged Care Pricing Authority. 2023. *ICD-10-AM/ACHI/ACS Twelfth Edition*. URL: <https://www.ihacpa.gov.au/resources/icd-10-amachiacs-twelfth-edition> (accessed 5 May 2025).

A4151	Sepsis due to Escherichia coli [E. Coli]
A4152	Sepsis due to Pseudomonas
A4158	Sepsis due to other Gram-negative organisms
A418	Other specified sepsis
A419	Sepsis, unspecified
A427	Sepsis due to actinomycosis
A547	Sepsis due to Gonococcus
B0071	Sepsis due to herpesviral [Herpes simplex] infection
B377	Sepsis due to Candida
O030	Spontaneous abortion, incomplete, complicated by genital tract and pelvic infection and sepsis
O035	Spontaneous abortion, complete or unspecified, complicated by genital tract and pelvic infection and sepsis
O040	Medical abortion, incomplete, complicated by genital tract and pelvic infection and sepsis
O045	Medical abortion, complete or unspecified, complicated by genital tract and pelvic infection and sepsis
O050	Other abortion, incomplete, complicated by genital tract and pelvic infection and sepsis
O055	Other abortion, complete or unspecified, complicated by genital tract and pelvic infection and sepsis
O060	Unspecified abortion, incomplete, complicated by genital tract and pelvic infection and sepsis
O065	Unspecified abortion, complete or unspecified, complicated by genital tract and pelvic infection and sepsis
O070	Failed medical abortion, complicated by genital tract and pelvic infection and sepsis
O075	Other and unspecified failed attempted abortion, complicated by genital tract and pelvic infection and sepsis
O080	Genital tract and pelvic infection and sepsis following abortion and ectopic and molar pregnancy
O85	Puerperal sepsis
P36	Sepsis of newborn
R572	Septic shock
R651	Severe sepsis

### ***Technical details for defining sepsis patients in an episode of care using NMDS data***

- **Sepsis identification:** Identify sepsis cases using a pre-specified list of ICD-10-AM explicit diagnosis codes.



- **Data source:** National Minimum Dataset (NMDs, hospital events).
- **Clinical codes:** See Appendix 1 for the explicit codes, including ICD-10-AM 12<sup>th</sup> edition.
- **Unit of analysis:** Define each episode of care according to NMDs guidelines as a patient admission with an overnight stay or longer. Include only admission types 'AA' or 'AC' from the first event of each episode.

#### Implementation steps:

- **Create episodes of care:** Join consecutive hospital events into a single episode if the gap between the end of one event and the start of the next is  $\leq 1$  day. This prevents double counting. Apply appropriate filters to control confounding impacts for each patient population.
- **Identify index admission event:** Select the first admission in each episode of care when multiple connected events exist.
- **Filter by admission type:** Include only index admissions with type 'AA' or 'AC'.
- **Identify sepsis episodes:** Include episodes containing any of the pre-specified explicit diagnosis codes from Appendix 1.
- **Determine index diagnosis:** If multiple explicit diagnosis codes exist within an episode, use the first code as the index diagnosis.
- **Determine onset:** Extract the onset code for the index diagnosis. Onset = 1 indicates hospital-acquired sepsis; onset = 2 indicates non-hospital-acquired sepsis.
- **Extract demographic and admission information:**
  - **Age:** Use the *age\_dis* variable from the index admission event to capture the patient's age within the episode of care.
  - **Gender:** Use the 'gender' variable from the index admission event to capture the patient's gender within the episode of care.
  - **Ethnicity:** Use the 'ethnicgp' variable from the index admission event to capture the patient's ethnicity within the episode of care.
  - **Admission type:** Use the 'adm\_type' variable from the index admission event to capture the patient's admission type within the episode of care.
  - **Other details:** Facility, DRG, and other episode-specific information can be included.
  - **End type:** Use the 'end\_type' variable of the last event in the episode of care.
- **Identifying patient populations:** Using index admission event information of the NMDs data, if the admission event has:
  - DRG code starting with 'O' → Maternity patients
  - else if age at discharge is under 18 → Paediatric patients
  - else if age at discharge is 18 and over → Adult patients
- **Readmissions:** An unplanned admission within 30 days of discharge of the episode of care for patients diagnosed with sepsis.

## Appendix 2: Summary of measures for sepsis

Type of measure	Measures
<b>Outcome measures</b>	<ul style="list-style-type: none"> <li>• O1: Rate of patients with sepsis diagnosis per 100 episodes of care</li> <li>• O2: In-hospital mortality rate for patients with sepsis diagnosis</li> <li>• O3: Median length of stay for patients with sepsis diagnosis</li> <li>• O4: 30-day readmission rate for patients with sepsis diagnosis</li> <li>• O5: Rate of septic shock among patients with sepsis diagnosis</li> </ul>
<b>Process measures</b>	<ul style="list-style-type: none"> <li>• Percentage of patients screened for sepsis using the national sepsis pathway or an approved local adaptation</li> <li>• Percentage of patients with RED FLAG sepsis who received all applicable Sepsis Six interventions within 60 minutes</li> </ul>
<b>Balancing measure</b>	<ul style="list-style-type: none"> <li>• Rate of intensive care unit admission for patients with sepsis diagnosis</li> </ul>
<b>Structural measure</b>	<ul style="list-style-type: none"> <li>• Percentage of clinical areas using the national sepsis pathway</li> </ul>

## Definitions for terms used in the measures

Term	Definition
Patients with a sepsis diagnosis	Patients identified with agreed sepsis diagnosis code in NMDS (or local patient administration system)
Patients	Any patient admitted and discharged from hospital or deceased during the episode of care in the hospital. Refer the 'Technical information for defining patients with sepsis in an episode of care using NMDS dataset' section in appendix 1 to identify adult, maternity and paediatric patients in NMDS
Episode of care	<p>The continuous period of health care provided to a patient under the care of one health care provider or team within one hospital, where the patient stayed overnight or for more than one night?</p> <p>Episodes of care may include one or more hospital admissions (or 'events') if the patient is transferred between wards, services or specialty areas during their stay</p>
Unplanned readmission	A patient returning to the hospital in an unplanned manner within a specified timeframe – commonly within 30 days of discharge – from either the same or a different hospital
Septic shock	Where a R57.2 code is assigned to a patient
Index episode of care	The initial (first) hospital admission event for a patient
Time zero	The earliest time when suspected or confirmed infection and a RED FLAG can be found together in the patient notes. If this occurs before hospital arrival, time zero is the emergency department triage time
RED FLAG sepsis	Where a clinician identifies one or more of the RED FLAG clinical criteria listed in the screening section of the pathway

Sepsis Six	Sepsis Six is a bundle of six evidence-based interventions designed to be delivered within one hour of identifying a patient with sepsis. When delivered together, these interventions improve patient outcomes and reduce mortality. The six interventions are listed on the second page (resuscitate section) of the pathway
Screened for sepsis	'Screened for sepsis' refers to the completion of the first page (recognition section) of the sepsis pathway

## Appendix 3: Outcome measures: details and methodology

<b>O1: Rate of patients with sepsis diagnosis per 100 episodes of care</b>	
Purpose	To understand the burden of sepsis within hospital admissions, monitor trends over time, identify high-risk groups and evaluate the impact of quality improvement initiatives
Numerator	Number of episodes of care during which patients were identified with a sepsis diagnosis
Denominator	Number of episodes of care
Calculation	Rate = (numerator ÷ denominator) x 100
Data source	Denominator: NMDS (or local patient administration system) Numerator: NMDS (or local patient administration system)
Analysis	Analyse and report the data by patient population, condition onset flag and demographics, including ethnicity, age and gender  Complement this with insights from local audits and clinical reviews to gain a deeper understanding and strengthen the measure.

<b>O2: In-hospital mortality rate for patients with sepsis diagnosis</b>	
Purpose	To help assess the quality and effectiveness of sepsis care, track outcomes and identify areas for improvement
Numerator	Number of episodes of care in which patients with a sepsis diagnosis died in hospital during their episode of care
Denominator	Number of episodes of care during which patients were identified with a sepsis diagnosis
Calculation	Rate = (numerator ÷ denominator) x 100
Data source	Denominator: NMDS (or local patient administration system) Numerator: NMDS (or local patient administration system)
Analysis	Analyse and report the data by patient population, condition onset flag and demographics, including ethnicity, age and gender  Complement this with insights from local audits and clinical reviews to gain a deeper understanding and strengthen the measure.
Inclusions/criteria	Any cause of death

<b>O3: Median length of stay for patients with sepsis diagnosis</b>	
Purpose	To help assess hospital efficiency, resource use and the impact of sepsis care on recovery and discharge outcomes
Calculation	Identify the median value of the length of stay (in days) of episodes of care for patients who were identified with a sepsis diagnosis
Data source	NMDS (or local patient administration system)

Analysis	<p>Analyse and report the data by patient population, condition onset flag and demographics, including ethnicity, age and gender</p> <p>Complement this with insights from local audits and clinical reviews to gain a deeper understanding and strengthen the measure.</p>
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<b>O4: 30-day readmission rate for patients with sepsis diagnosis</b>	
Purpose	To help assess the quality of discharge planning and post-hospital care, identify gaps in recovery support and highlight opportunities to reduce preventable rehospitalisation
Numerator	Number of patients with a diagnosis of sepsis in episodes of care who had an unplanned readmission to either the same or a different hospital within 30 days of discharge of the episode of care
Denominator	Number of patients discharged from the hospital with a diagnosis of sepsis
Calculation	Rate = (numerator ÷ denominator) x 100
Data source	Denominator: NMDS (or local patient administration system) Numerator: NMDS (or local patient administration system)
Analysis	Analyse and report the data by patient population, condition onset flag and demographics, including ethnicity, age and gender  Complement this with insights from local audits and clinical reviews to gain a deeper understanding and strengthen the measure.
Inclusions/criteria	Readmission for any reason

<b>O5: Rate of septic shock among patients with sepsis diagnosis</b>	
Purpose	To monitor the frequency of patients who develop septic shock, assess the severity of sepsis cases and evaluate the timeliness and effectiveness of interventions such as fluid resuscitation and vasopressor therapy
Numerator	Number of episodes of care in which patients had a septic shock diagnosis (R57.2)
Denominator	Number of episodes of care during which patients were identified with a sepsis diagnosis
Calculation	Rate = (numerator ÷ denominator) x 100
Data source	Denominator: NMDS (or local patient administration system) Numerator: NMDS (or local patient administration system)
Analysis	Analyse and report the data by patient population, condition onset flag and demographics, including ethnicity, age and gender  Complement this with insights from local audits and clinical reviews to gain a deeper understanding and strengthen the measure.
Inclusions/criteria	Use septic shock diagnosis code (R57.2) to identify patients with septic shock

## Appendix 4: Process measures: details and methodology

These measures apply only to hospitals using a recognised sepsis pathway. If the pathway cannot be found in the clinical notes or other records, it will be assumed that the pathway was not used.

<b>P1: Percentage of patients screened for sepsis using the national sepsis pathway or an approved local adaptation</b>	
Purpose	To identify how well the pathway is used to recognise sepsis, track improvement over time and identify gaps
Numerator	Number of patients with sepsis who were screened for sepsis using the national pathway
Denominator	Number of patients identified with a sepsis diagnosis
Calculation	Percentage= (numerator ÷ denominator) x 100
Data source	Denominator: NMDS (or local patient administration system) Numerator: Manual audit for paper-based systems; automated report if electronic
Analysis	Analyse and report the data by patient population and demographics, including ethnicity, age and gender

<b>P2: Percentage of patients with RED FLAG sepsis who received all applicable Sepsis Six interventions within 60* minutes</b>	
Purpose	To understand, track and improve how effectively the Sepsis Six bundle is delivered
Numerator	Number of patients who received all applicable Sepsis Six resuscitation interventions within 60* minutes of time zero
Denominator	Number of patients screened for sepsis using the pathway and identified with RED FLAG sepsis
Calculation	Percentage= (numerator ÷ denominator) x 100
Data source	Denominator: Manual audit for paper-based systems; automated report if electronic  Numerator: Manual audit for paper-based systems; automated report if electronic
Analysis	Analyse and report the data by patient population, condition onset flag and demographics, including ethnicity, age and gender
Definition	'Applicable': Not all six interventions may be required for every patient. Interventions marked as 'N/A' should be excluded from the calculation. For example, if oxygen is not applicable, the audit will assess how many of the remaining five interventions were completed
Inclusions/criteria	To qualify for the denominator, two conditions must be met. <ol style="list-style-type: none"> <li>1. The patient has been screened for sepsis using the pathway.</li> <li>2. The patient was identified with RED FLAG sepsis.</li> </ol>



	In other words, this denominator includes patients with RED FLAG sepsis from the numerator population of the process measure P1.
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\* While the 60-minute target remains ideal, teams can also track Sepsis Six delivery up to 180 minutes. This allows for a better understanding of overall patient care and captures cases where one or more interventions are administered slightly beyond the recommended 60-minute target. We recommend analysing the delivery of these interventions across a time scale. This approach helps teams assess overall sepsis care effectiveness, identify patterns of delay, and implement targeted improvements, while still recognising patients who receive most interventions within an acceptable timeframe.

### ***Additional process measures***

While the above measure captures overall compliance with the Sepsis Six bundle, we recommend that teams also measure compliance with each individual Sepsis Six/resuscitation intervention. Measure P2.1 below illustrates this. We encourage teams to develop similar measures for the other interventions within the Sepsis Six and to analyse their delivery across a time scale as described above to better understand patterns and timing of care.

<b>P2.1: Percentage of patients with RED FLAG sepsis who received the IV antibiotic within 60 minutes from time zero</b>	
Purpose	To assess the timeliness of intravenous (IV) antibiotic administration for patients identified with RED FLAG sepsis. Early administration of antibiotics is a critical component of sepsis management and is strongly associated with improved survival and reduced complications
Numerator	Number of patients with RED FLAG sepsis who received their first dose of IV antibiotics within 60 minutes of time zero
Denominator	Number of patients identified with RED FLAG sepsis for whom IV antibiotic administration was indicated
Calculation	Percentage = (numerator ÷ denominator) x 100
Data source	Denominator: Manual audit for paper-based systems; automated report if electronic Numerator: Manual audit for paper-based systems; automated report if electronic
Analysis	Analyse and report the data by patient population, condition onset flag and demographics, including ethnicity, age and gender
Inclusions/criteria	Exclusion: patients transferred from another facility who had already received IV antibiotics

## Appendix 5: Balancing measure: details and methodology

<b>B1: Rate of intensive care unit admission for patients with sepsis diagnosis</b>	
Purpose	To monitor the proportion of patients with sepsis requiring intensive care, evaluate the severity of their sepsis and assess the timeliness and effectiveness of early interventions and escalation protocols
Numerator	Number of episodes of care during which patients with a diagnosis of sepsis were admitted to the intensive care unit
Denominator	Number of episodes of care during which patients were identified with a sepsis diagnosis
Calculation	Rate = (numerator ÷ denominator) x 100
Data source	Denominator: NMDS (or local patient administration system) Numerator: NMDS (or local patient administration system)
Analysis	Analyse and report the data by patient population and demographics, including ethnicity, age and gender  Complement this with insights from local audits and clinical reviews to gain a deeper understanding and strengthen the measure.

## Appendix 6: Structural measure: details and methodology

<b>S1: Percentage of clinical areas using national sepsis pathway</b>	
Purpose	To monitor the adoption and use of a recognised sepsis pathway across various clinical areas in the hospital
Numerator	Number of clinical areas (wards, departments or units) that have implemented the sepsis pathway
Denominator	Number of clinical areas where sepsis patients are managed
Calculation	Percentage = (numerator ÷ denominator) x 100
Data source	Denominator: Local data Numerator: Local data
Analysis	Analyse and report the data by patient population and demographics, including ethnicity, age and gender
Definition	Implemented here refers to the use of pathway as a routine.
Inclusions/criteria	Includes satellite facilities as well

## Appendix 7: Details of audit tool and process

We have developed an [audit tool](#) in Microsoft Forms, to support the implementation of the sepsis package and measurement for all patient populations. Based on the updated sepsis pathway, it captures data related to the steps outlined in the pathway. The audit tool is currently hosted on the Commission's domain. Before implementing the sepsis package, please obtain a copy of the tool and host it on your local server to ensure full access to audit data. To request the audit tool template, contact [Sepsis@hqsc.govt.nz](mailto:Sepsis@hqsc.govt.nz)

### ***Audit tool***

Link: <https://forms.office.com/r/bSWcKgtPxq>

QR code:



### ***Steps to complete the audit***

Take the following steps to complete the audit.

1. Obtain a list of National Health Index (NHI) numbers for auditing from your data and analytics team.
2. Ensure auditors have access to patient clinical notes/files.
3. Gather the relevant files for the audit.
4. Use the provided link/QR code to access the data collection tool.
5. Assign a serial number to each NHI and enter it in the audit tool.
6. Follow the on-screen instructions to complete the audit.
7. Keep a record of the NHIs audited with assigned serial numbers for future clinical record review if needed.

### ***Checklist to implement audit system***

Ensure the following, in the context of the audit.

- ☐ Share methodology with the data and analytics team within your hospital.
- ☐ The data team can create a query using their local system/programme/software.
- ☐ Generate a report with NHIs for auditing.
- ☐ Agree on the frequency of the report.
- ☐ Identify and train auditors.
- ☐ Complete an audit to establish the baseline.
- ☐ Agree on the frequency of data collection.
- ☐ Undertake ongoing data collection.